Nationwide Outcomes Measurement in Colorectal Cancer Surgery: Improving Quality and Reducing Costs

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BACKGROUND: Recent literature suggests that focus in health care should shift from reducing costs to improving quality; where quality of health care improves, cost reduction will follow. Our primary aim was to investigate whether improving the quality of surgical colorectal cancer care, by using a national quality improvement initiative, leads to a reduction of hospital costs.

STUDY DESIGN: This was a retrospective analysis of clinical and financial outcomes after colorectal cancer surgery in 29 Dutch hospitals (9,913 patients). Detailed clinical data were obtained from the 2010 to 2012 population-based Dutch Surgical Colorectal Audit. Patient-level costs were measured uniformly in all participating hospitals and based on time-driven, activity-based costing. Odds ratios (OR) and relative differences (RD) were risk adjusted for hospitals and differences in patient characteristics.

RESULTS: Over 3 consecutive years, severe complications and mortality declined by 20% (risk-adjusted OR 0.739, 95% CI 0.653 to 0.836, $p < 0.001$), and 29% (risk-adjusted OR 0.757, 95% CI 0.571 to 1.003, $p = 0.05$), respectively. Simultaneously, costs during primary admission decreased 9% (risk-adjusted RD −7%, 95% CI −10% to −5%, $p < 0.001$) without an increase in costs within the first 90 days after discharge (RD −2%, 95% CI −10% to 6%, $p = 0.65$). An inverse relationship (at hospital level) between severe complication rate and hospital costs was identified ($R = 0.64$). Hospitals with increasing severe complication rates (between 2010 and 2012) were associated with increasing costs; hospitals with declining severe complication rates were associated with cost reduction.

CONCLUSIONS: This report presents evidence for simultaneous quality improvement and cost reduction. Participation in a nationwide quality improvement initiative with continuous quality measurement and benchmarked feedback reveals opportunities for targeted improvements, bringing the medical field forward in improving value of health care delivery. The focus of health care should shift to improving quality, which will catalyze costs savings as well. (J Am Coll Surg 2016;222:19−29. © 2016 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)

Drs Tollenaar and Wouters contributed equally to this work.

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Abbreviations and Acronyms

ASA = American Society of Anesthesiologists classification
DSCA = Dutch Surgical Colorectal Audit
OR = odds ratio
Q1 = first 90 days after discharge
R = correlation coefficient
RD = relative difference

Although consistently ranked number 1 in the European Health Consumer Index since 2008,[1] the Dutch health care system is struggling with rising costs. As one of the most expensive health care systems in Europe, the expenditure rose to 13.2% of the gross domestic product in 2012.[2] In the last decades, health care providers have sought for solutions to stop this ongoing rise of health care costs. In spite of the well-intended effort, such as enforcing clinical guidelines or focus on volume and profitability of services, results have been meager.

The cornerstone of potential cost reduction could be availability of key clinical data on processes and outcomes of care.[3] Despite the important societal and economic role the health care system fulfills, it still lags behind when it comes to standardized reporting processes. In the past, data to compare the performance of different health care providers were scarce. With Sweden as a pioneer, worldwide clinical registries (audits) have been initiated on a regional or national level, leading to demonstrable improvement in clinical outcomes and smaller variation between providers.[4-7] With the introduction of the Dutch Surgical Colorectal Audit (DSCA) in 2009,[8] robust quality information became available, enabling monitoring, evaluation, and improvement of surgical colorectal cancer care in the Netherlands. The DSCA dataset covers 3 aspects: case-mix variables (eg, age, sex, and comorbidity) necessary for hospital comparison; process variables (eg, wait times, multidisciplinary team meetings, complete colonoscopy); and outcomes of care (eg, mortality, length of hospital stay, number of lymph nodes, and complications like anastomotic leakage, pneumonia, or reinterventions). Key performance indicators, accompanied by a national benchmark, are fed back to clinicians on a weekly basis. Since the introduction of the DSCA, postoperative morbidity and mortality have declined. Despite the substantial registration effort, this might have led to significant savings in costs.[7]

To explore the effect of this nationwide quality improvement initiative on health care costs, we conducted a comprehensive multi-center study involving 29 Dutch hospitals, using detailed clinical data from the DSCA and financial data based on time-driven, activity-based costing.[9] The aim of this study was to analyze whether nationwide collection of key clinical data and benchmarked feedback on performance indicators for colorectal cancer care lead to a reduction of hospital costs. Moreover, by combining and examining both clinical and financial outcomes, we examined whether identification of best practice hospitals, providing high quality colorectal cancer care for relatively low costs, is feasible.

METHODS

Clinical data

The dataset was retrieved from the DSCA, a population-based database in which detailed patient, tumor, diagnostic, procedural, and outcomes data are registered for all patients in the Netherlands undergoing resection of a primary colorectal carcinoma. The DSCA dataset is based on evidence-based guidelines, and each participating hospital appoints a surgeon responsible for (supervising) the data registration in a secured web form. Data are retrieved directly from the hospital information system (eg, date of birth, sex, and unique patient identification number) and by manual data collection (eg, tumor and operation characteristics). Data validity is achieved in various ways: by providing direct feedback on missing or erroneous data during data entry through quality control tools that are built in the program, by providing feedback information on the number of patients and completeness of the data per hospital, and by yearly external validation of the total dataset. The dataset shows nearly 100% completeness on most items and high accuracy level on validation (97% in 2012) against the Netherlands Cancer Registry.[7,8] A detailed description of the DSCA has been published recently.[7,10]

Financial data

The economic evaluation was conducted from a hospital perspective. As such only in-hospital costs were considered. Costs were taken into account from the day of initial surgery till discharge (primary admission) and up to 90 days after discharge (Q1). Information on resource use at patient level (eg, laboratory orders, operation room time, or ward days [Supplemental Table 1, online only]) was extracted from the hospital information system from each participating hospital. For each hospital, translation of patient level resource use into costs was provided by Performation (formerly known as TRAG Performance Intelligence), a health care consultancy firm providing patient level costing and benchmarking products for more than 100 hospitals across Europe.[11,12] Costs were calculated using time-driven, activity-based costing,[9] an advanced method for understanding hospitals costs.[13,14] Cost price calculations were standardized by Performation, so uniformity in methodology existed between all